

CDS 130 Mid-term exam review

Topics:

1. Binary Number Representation
 - 1) Bases
 - 2) Binary to decimal number conversion
 - 3) Decimal to binary number conversion (template method and the extended template method)
 - 4) Decimal to hex number conversion
 - 5) Binary to hex number conversion
 - 6) Hex to binary number conversion
 - 7) Conversion between different bases (e.g, base-8 to base-7)
2. Bit Patterns
 - 1) number of bit patterns for N bits: 2^N
 - 3) unique combinations of 0s and 1s in N bits: 2^N
 - 2) the largest integer number represented by N bits: 2^N-1
3. Binary Arithmetic
 - 1) Binary number addition
 - 2) Binary number subtraction
 - 3) Binary number multiplication
 - 4) Binary numbers multiplied by decimal powers of two (2^N)
4. Binary representation of negative numbers
 - 1) sign-and-magnitude representation and its range
 - 2) One's complement representation of numbers
 - 3) two's complement representation and its range
 - 4) Excess-N method to represent numbers and its range.
5. Binary subtraction with the two's complement method.
6. Encoding
 - 1) ASCII code
 - 2) Encode words
 - 3) Interpret ASCII codes
7. Computing Limitation
 - 1) Overflow
 - 2) Data range represented by N bits
8. Data storage
 - 1) bits, nibbles, bytes, words
 - 2) Kilobytes, Megabytes, and Gigabytes.

MATLAB

9. Variables

- 1) vectors,
- 2) Rules for naming variables in Matlab
- 3) various data types
integers, real numbers and characters.
- 4) conversion between different data types.
- 5) Assignment and rules.
counter = 1;
counter = counter + 2;
counter = counter *2;

10. Meanings of symbols used in Matlab.

Percent (%), comma (,), semi colon (:), semi comma (;)

11. Syntax for matlab built functions

sin(); cos(); tan(); sind();
exp(); log2(); log10();
ceil(); floor(); round();
mod();

12. User defined matlab functions:

- (1) Write a user defined matlab function
- (2) Define anonymous function.

13. Create vectors : Row vector and Column vector

method 1: A(5) = 1;

method 2: A = [2,3,4,5]; or A=[2; 3; 4; 5;]

For row vectors, you can use either commas or spaces to separate the elements

method 3: A = 2: -1: -6; (colon notation).

If the increment is 1, the short-handed notation is A = 2:5; (i.e., A=[2, 3, 4, 5])

method 4: form a new vector from previously defined vectors

```
>> A = [1, 2, 3];  
>> B = [3, 4, 5];  
>> C = [A, B];  
>> D = [A, -B];
```

method 5: rand(), zeros() and ones().

```
>> A = rand(1,5);  
>> B = zeros(1,5);  
>> C = ones(1,6);
```

14. Address vector elements

- 1) A(1:3) is a new vector
- 2) A(0.2) is invalid
- 3) Meanings of A([2:4])

15. Vector operations

1) Vector added by a scalar

```
>> A = [1, 2, 3];
```

```
>> B = A + 3.0
```

```
B =
```

```
4 5 6
```

3) Vector multiplied by a scalar

```
>> A = [1, 2, 3];
```

```
>> B = A * 3.0;
```

```
B =
```

```
3 6 9
```

2) Add two vectors

```
>> A = [1, 2, 3]
```

```
>> B = [3, 4, 5]
```

```
>> C = A+B
```

```
C =
```

```
[4, 6, 8]
```

4) Vector summation (sum of all vector elements)

```
>> C = [4, 6, 8];
```

```
>> sum(C)
```

```
ans = 20
```

5) Element-by-element operation (dot operators)

```
>> C = A. * B
```

```
C =
```

```
[3, 8, 15]
```

```
>> C = [1 1 1]. / A;
```

```
C =
```

```
1 0.5 0.33333
```

```
>> C = [2, 4, 5].^2
```

16. Examine the content of a variable

method 1: >> whos A

17. Using vector elements

```
i=5
```

```
A=3:8;
```

```
B(1:6) = A.^2;
```

```
j=3;
```

```
A(2) + B(2)
```

18. Matlab input and display commands.

```
input();
```

```
disp()
```